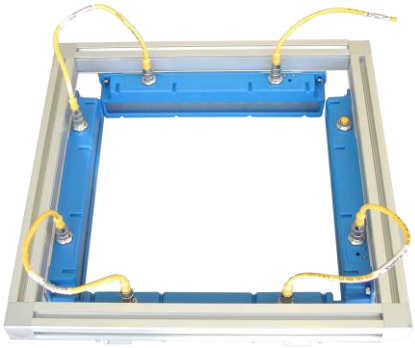
PRODUCT DATA SHEET

DFL Series | **DARK FIELD** | Adjustable Ring

product introduction

The Adjustable Dark Field Ring acts as a mount to daisy chain linear lights together in a square pattern. Users can attach up to 4 linear lights. Light features a 360˚ illumination field with two available sizes. In strobing application, all lights will pulse at the same time with either the NPN or PNP signal input. Each individual light has a manual intensity adjustment or automatically dim all four via the 0-10V analog intensity control.

product features

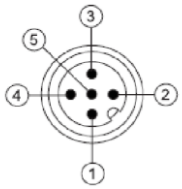


- Adjustable lights on aluminum extrusion
- 300x300mm or 600x600mm Area
- Lights can be strobed together or separate
- Drive built in – No External wiring to a driver
- PNP and NPN Strobe input
- Continuous operation or Strobe mode
- Dimmable via built in potentiometer
- Analog intensity 0-10VDC signal
- Standard optics provide tight light pattern

product specifications

Electrical Input	24VDC +/- 5%
Strobe Input	PNP ► +5VDC or greater to activate. | NPN ► GND (<1VDC) to activate
Continuous Mode	Light will be in continuous mode by leaving signal on strobe input active
Potentiometer	Intensity control of 10% to 100% Clockwise increases intensity
Analog Intensity	The output is adjustable from 10 -100% of brightness by a 0 -10VDC signal
Connection	5 pin M12 connector
Daisy Chain	Up to four L300

wiring configuration



1 – 24V
2 – NPN
3 – GND
4 – PNP
5 – 0-10V

Standard M12 mating cable color

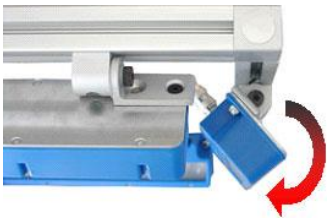
BROWN
WHITE
BLUE
BLACK
*GRAY (GREEN/YELLOW)

If Analog 0-10VDC is not used to control light intensity;
+VDC (24VDC) must be connected to Analog Input - Jumper pin 5 to pin 1

PIN	Wire Color	Function	Signal
1	BROWN	Power	+24VDC
2	WHITE	NPN Strobe	GND for Active ON
3	BLUE	Ground	GND
4	BLACK	PNP Strobe	4VDC to 30VDC for Active ON
5	GREEN	Analog Intensity Control	0-10VDC

mounting

Lights adjustable 90 degrees – Full vertical to horizontal swing



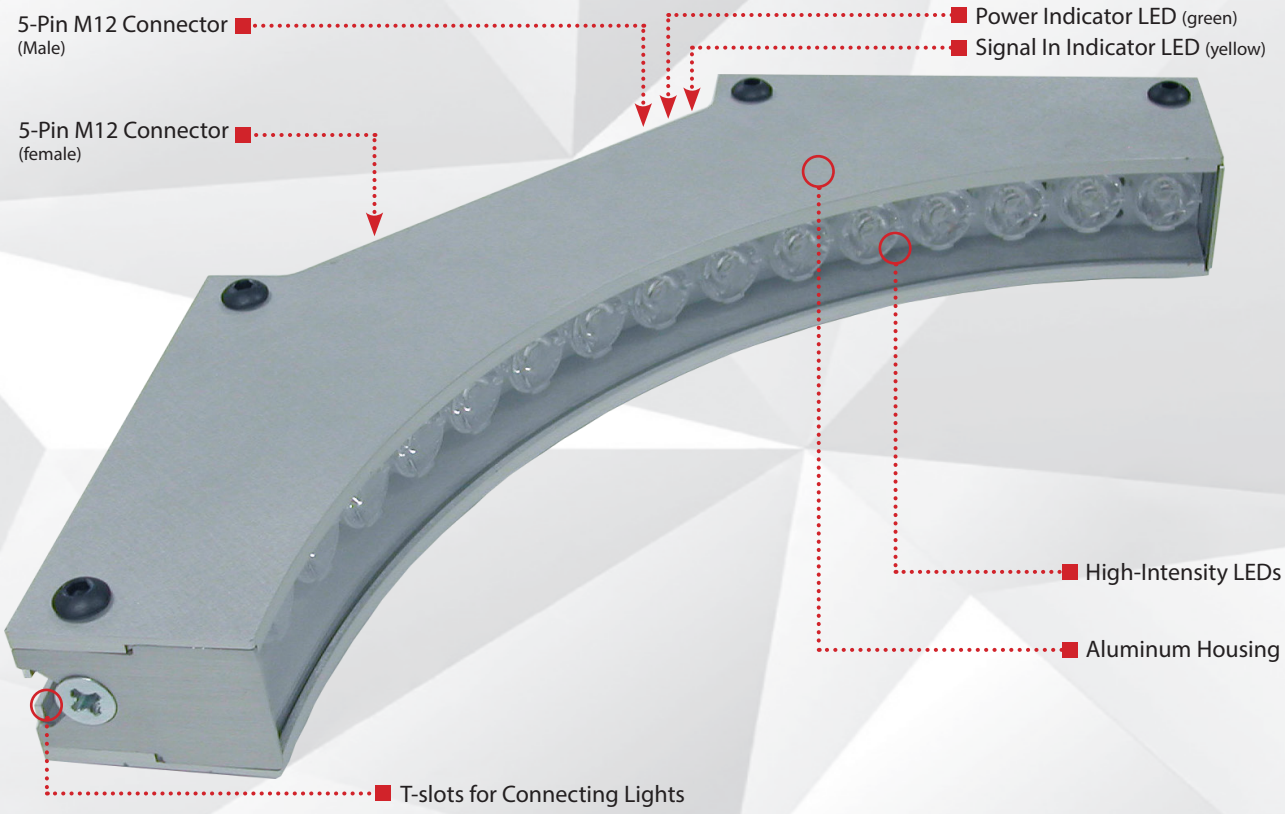
smart vision lights

DFL-460 *Connect-a-Light*

LINEAR LIGHT

DARK FIELD

PRODUCT DATA SHEET



Warranty	Compliant	Compliant	Rated	Connector
10 YEAR	IEC 62471	CE RoHS	IP 50	5-PIN M12

PRODUCT HIGHLIGHTS

- ✓ Ability to "wrap" light around curved surfaces
- ✓ Built-in driver
- ✓ PNP and NPN trigger signal input
- ✓ T-slot for mounting and for daisy-chaining lights together
- ✓ Easily connect lights to get 180°, 270°, or 360° illumination coverage

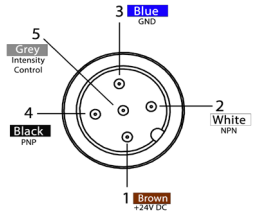
PRODUCT DESCRIPTION

The DFL-460 Dark Field Linear Light provides a round 90˚ light illumination, allowing the light to "wrap" around a curved surface. Daisy-chain up to 4 lights together to cover an area up to 360˚. Use NPN or PNP trigger signal to control the light's pulse. Control intensity via a 1–10V analog signal line.

PRODUCT SPECIFICATIONS

Electrical Input	24VDC +/– 5%
Input Current	Max. 2A
Wattage	Max. 48 W
On/Off Input	PNP : +4VDC or greater to activate | NPN : GND (<1VDC) to activate
PNP Line	4 mA @ 4VDC | 10 mA @ 12VDC | 20 mA @ 24VDC
NPN Line	15 mA @ ground (0V DC)
Yellow Indicator LED	LED strobe indicator ON = light active
Green Indicator LED	ON = Power
Continuous Mode	NPN can be tied to ground **OR** PNP can be tied to 24VDC (not both)
Analog Intensity	Brightness output is adjustable from 10%–100% via a 1–10VDC signal. (Jumpering pin 5 to pin 1 will provide maximum intensity.)
Connection	5-pin M12 connector
Ambient Temperature	0º–40ºC (32º–114ºF)
IP Rating	IP50
Weight	~455 g
Compliances	CE, RoHS, IEC 62471
Warranty	10 year warranty. For complete warranty information, visit smartvisionlights.com/warranty.

WIRING CONFIGURATION



Pin layout for light (Male Connector)

Pins	Function	Signal	Wire Color
1	Power in	+24VDC	BROWN
2	NPN Strobe	GND for active ON	WHITE
3	Ground	GND	BLUE
4	PNP Strobe	+24VDC for active on	BROWN
5	Intensity Control	1-10VDC	GREY

OPTIONAL

For maximum intensity, connect pin 5 to pin 1 at +24VDC.

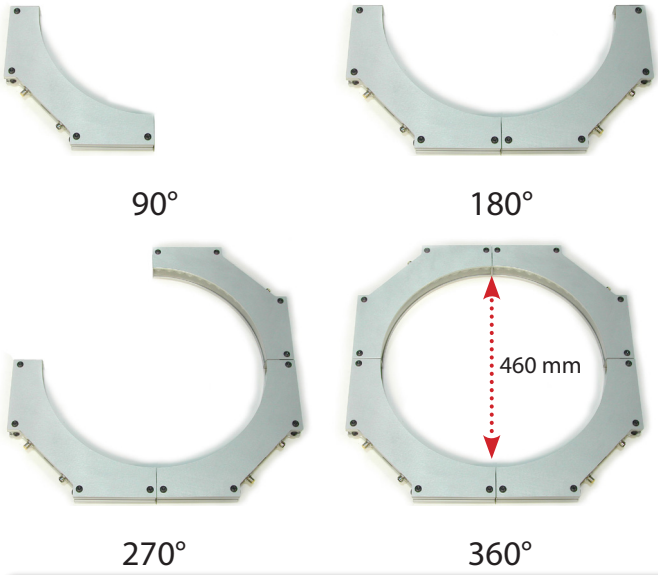
**Some cables use green/yellow for pin 5.*
For maximum intensity, tie pin 5 to pin 1 at +24VDC.
*For continuous mode, PNP (pin 4) can be tied to +24VDC (pin 1) **or** NPN (pin 2) can be tied to Ground (pin 3).*

RESOURCE CORNER

Additional resources, including CAD files, videos, and application examples, are available on our website.

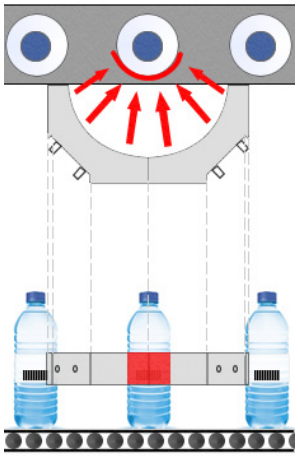
AREA ILLUMINATION

Connect up to four DFL-460 linear lights together. When four lights are connected, the inside diameter is 460 mm.



"WRAP" LIGHT

The DFL-460 is able to "wrap" around an object. This feature allowing for a homogeneous light pattern to be outputted onto a curved surface.



LIGHT PATTERNS

LIGHTING PATTERN FOR THE DFL-460 **with Line Standard Lenses**

Typical Output Performance	Illuminance (Lux)
Distance = 500 mm	36,000
Illumination measurement taken on White Lights, 5700K	

LIGHTING PATTERN FOR THE DFL-460 **with Wide (W) Lenses**

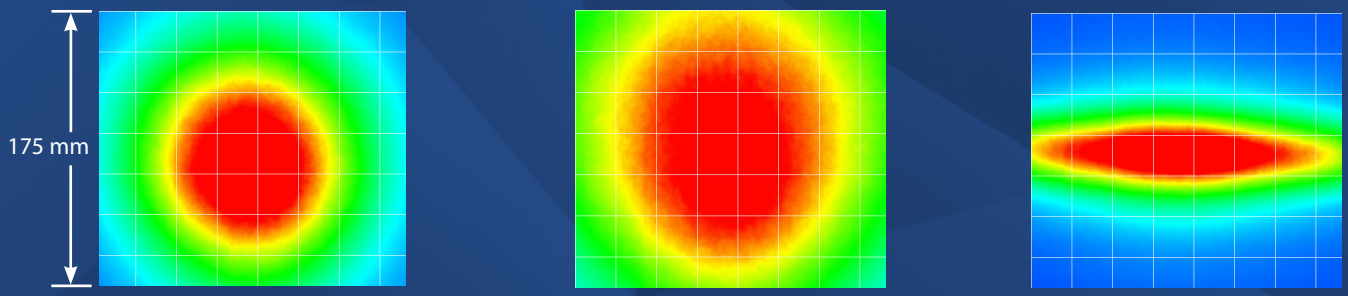
Typical Output Performance	Illuminance (Lux)
Distance = 500 mm	24,000
Illumination measurement taken on White Lights, 5700K	

LIGHTING PATTERN FOR THE DFL-460 **with Narrow (N) Lenses**

Typical Output Performance	Illuminance (Lux)
Distance = 500 mm	67,000
Illumination measurement taken on White Lights, 5700K	

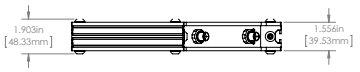
The DFL-460 Linear Light produces a uniform light pattern.

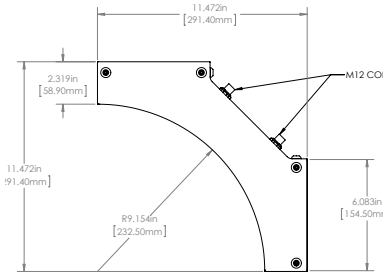
Working Distance = 500 mm Grid set to 25 mm x 25 mm



PRODUCT DRAWING

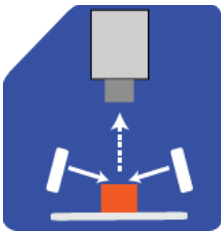
CAD files available on our website.
Dimensions are in mm.





ILLUMINATION

DFL-460 Series of Linear Lights works best for:



Dark Field

EYE SAFETY

According to IEC 62471:2006. Full documentation available upon request.

Notice

Exempt Group: No photobiological hazard to eyes or skin even for continuous, unrestricted use. Applicable for wavelengths 625, 850, and 940.

Caution

Risk Group 1: Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to eyes. Safe for most applications except prolonged exposure. Applicable for wavelengths 470, 505, 530, and WHI.

PART NUMBER

DFL-460 – □□□ – □

COLOR:

WHI 470 505 530 625 850 940

LENS:

Leave blank for Standard (Line)

W = Wide

N = Narrow

Part Number Examples:

DFL-460-625 DFL-460, 625 nm Red Wavelength, Standard (Line) Lens

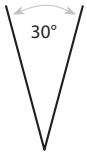
DFL-460-WHI-N DFL-460, White, Narrow Lens

Line lens optic not available for UV wavelengths.
Additional wavelengths and lens options available upon request.

STANDARD LENS OPTICS

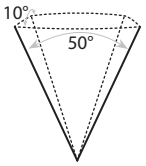
NARROW
Narrow, 14° angle-cone lenses are standard. Standard lenses project a narrow beam of illumination and are used for long working distances.

WIDE
Wide, 30° angle-cone lenses project a large area of illumination. They create a floodlight effect and can be used for short working distances.



LINE
Line lenses are standard.
Line, with a 10° width and a 50° fan angle, projects a thin, narrow beam of illumination.

Additional lens options available upon request.



MOUNTING

Smart Vision Lights recommends using a 5/16" drop-in T-nut with the T-slot for mounting.

ACCESSORIES

Jumper Cables (Daisy Chain)

Lengths	Part Number
300 mm	5PM12-J300
1000 mm	5PM12-J1000
2000 mm	5PM12-J2000

Power Cables

Lengths	Part Number
5 m	5PM12-5
10 m	5PM12-10
15 m	5PM12-15

Connector (Only for Direct Connect)

Description	Part Number
Set of 2 Connectors	LXJ-2DTN

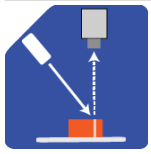
GLOSSARY

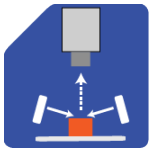
This glossary covers all Smart Vision Lights product families; some content in this section may not apply to this specific light.

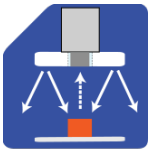
TERMINOLOGY

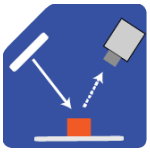
OverDrive™ Light includes an integrated high-current strobe driver for complete LED light control.
Continuous Operation Light stays on continuously.
Multi-Drive™ Combines continuous operation and OverDrive™ strobe (high-current strobe operation) modes into one easy-to-use light.
Built-In Driver The built-in driver allows full function without the need of an external driver.
Camera to Light Connecting the light directly to the camera, without the need for additional controllers or equipment.
Polarizers Filters that reduce reflections on specular surfaces.
Diffuser Used to widen the angle of light emission, reduce reflections, and increase uniformity.

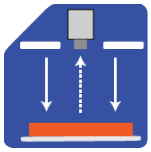
TYPES OF ILLUMINATIONS

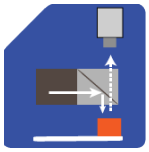

Projector

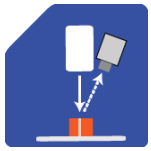

Dark Field

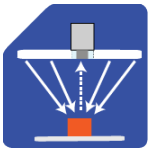

Radial

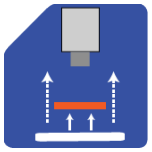

Bright Field


Direct


Axial

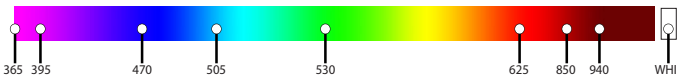

Line


Diffuse Panel


Backlight

COLOR/WAVELENGTHS LEGEND

Wavelength options range from 365 nm to 1550 nm.
Additional wavelengths available for many light families.



*See Part Number section for **this light's** available standard wavelengths.*

SWIR SHORTWAVE **INFRARED**

Shortwave infrared LEDs are available in 1050 nm, 1200 nm, 1300 nm, 1450 nm, and 1550 nm.
*Check Part Number section to see if **this light** is available in SWIR wavelengths.*

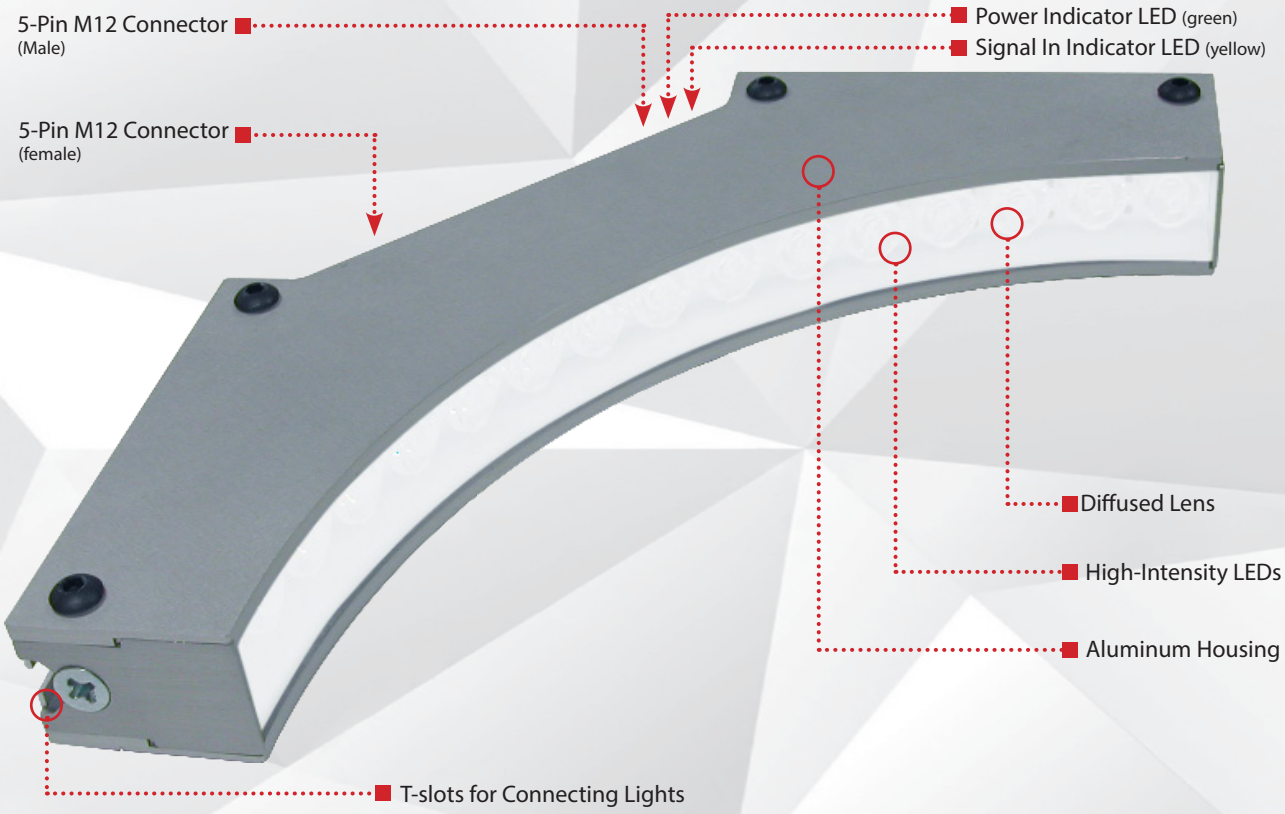
smart vision lights

DFLB-460 *Connect-a-Light*

LINEAR LIGHT

DARK FIELD

PRODUCT DATA SHEET



Warranty	Compliant	Compliant	Rated	Connector
10 YEAR	IEC 62471	CE RoHS	IP 50	5-PIN M12

PRODUCT HIGHLIGHTS

- ✓ Ability to "wrap" light around curved surfaces
- ✓ Built-in driver
- ✓ PNP and NPN trigger signal input
- ✓ T-slot for mounting and for daisy-chaining lights together
- ✓ Easily connect lights to get 180°, 270°, or 360° illumination coverage

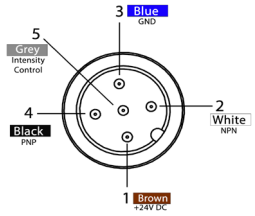
PRODUCT DESCRIPTION

The DFLB-460 Dark Field Linear Light provides a round 90˚ light illumination, allowing the light to "wrap" around a curved surface. Daisy-chain up to 4 lights together to cover an area up to 360˚. Use NPN or PNP trigger signal to control the light's pulse. Control intensity via a 1–10V analog signal line.

PRODUCT SPECIFICATIONS

Electrical Input	24VDC +/– 5%
Input Current	Max. 2A
Wattage	Max. 48 W
On/Off Input	PNP : +4VDC or greater to activate | NPN : GND (<1VDC) to activate
PNP Line	4 mA @ 4VDC | 10 mA @ 12VDC | 20 mA @ 24VDC
NPN Line	15 mA @ ground (0VDC)
Yellow Indicator LED	LED strobe indicator ON = light active
Green Indicator LED	ON = Power
Continuous Mode	NPN can be tied to ground **OR** PNP can be tied to 24VDC (not both)
Analog Intensity	Brightness output is adjustable from 10%–100% via a 1–10VDC signal. (Jumpering pin 5 to pin 1 will provide maximum intensity.)
Connection	5-pin M12 connector
Ambient Temperature	0º–40ºC (32º–114ºF)
IP Rating	IP50
Weight	~455 g
Compliances	CE, RoHS, IEC 62471
Warranty	10 year warranty. For complete warranty information, visit smartvisionlights.com/warranty.

WIRING CONFIGURATION



Pin layout for light (Male Connector)

Pins	Function	Signal	Wire Color
1	Power in	+24VDC	BROWN
2	NPN Strobe	GND for active ON	WHITE
3	Ground	GND	BLUE
4	PNP Strobe	+24VDC for active on	BROWN
5	Intensity Control	1-10VDC	GREY

OPTIONAL

For maximum intensity, connect pin 5 to pin 1 at +24VDC.

**Some cables use green/yellow for pin 5.*
For maximum intensity, tie pin 5 to pin 1 at +24VDC.
*For continuous mode, PNP (pin 4) can be tied to +24VDC (pin 1) **or** NPN (pin 2) can be tied to Ground (pin 3).*

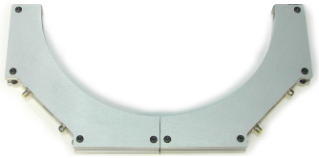
RESOURCE CORNER

Additional resources, including CAD files, videos, and application examples, are available on our website.

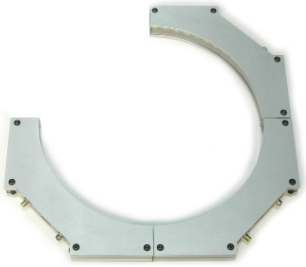
AREA ILLUMINATION

Connect up to four DFLB-460 linear lights together. When four lights are connected, the inside diameter is 460 mm.

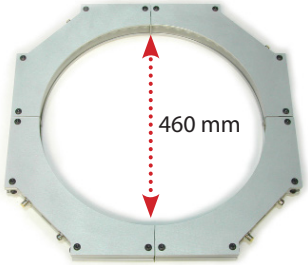
90°



180°



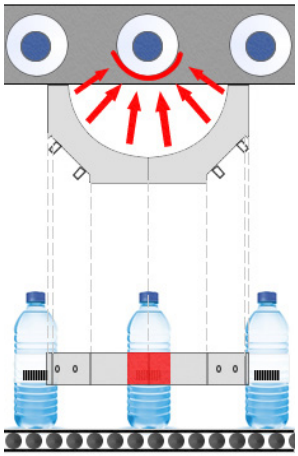
270°



360°

"WRAP" LIGHT

The DFLB-460 is able to "wrap" around an object. This feature allowing for a homogeneous light pattern to be outputted onto a curved surface.

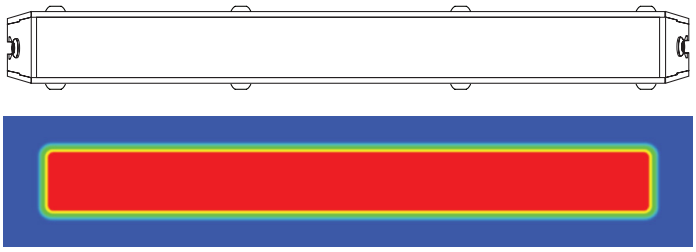


OPTICAL PERFORMANCE

The DFLB-460 offers a very diffuse light pattern.

OPICTAL PERFORMANCE FOR THE DFLB-460

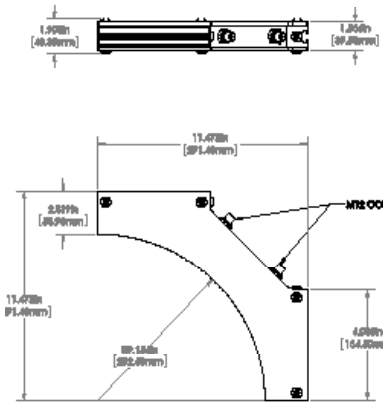
Rating	Illumination (Lux)
Average Intensity Rating	42,000
Lux measurement taken at surface of DFLB-460	



PRODUCT DRAWING

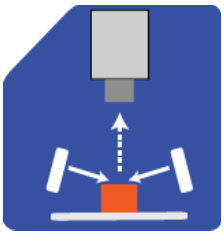
CAD files available on our website

Dim



ILLUMINATION

DFLB-460 Series of Linear Lights works best for:



Dark Field

EYE SAFETY

According to IEC-62471:2006. Full documentation available upon request.

Notice

Exempt Group: No photobiological hazard to eyes or skin even for continuous, unrestricted use. Applicable for wavelengths 625, 850, and 940.

Caution

Risk Group 1: Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to eyes. Safe for most applications except prolonged exposure. Applicable for wavelengths 470, 505, 530, and WHI.

PART NUMBER

DFLB-460 – □□□ – □

COLOR:

WHI | 470 | 505 | 530 | 625 | 850 940

LENS:

Leave blank for Standard (Line)

W = Wide

N = Narrow

Part Number Examples:

DFLB-460-625 DFLB-460, 625 nm Red Wavelength, Standard (Line) Lens

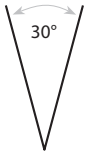
DFLB-460-WHI-N DFLB-460, White, Narrow Lens

Line lens optic not available for UV wavelengths.
Additional wavelengths and lens options available upon request.

STANDARD LENS OPTICS

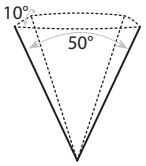
NARROW
Narrow, 14° angle-cone lenses are standard. Standard lenses project a narrow beam of illumination and are used for long working distances.

WIDE
Wide, 30° angle-cone lenses project a large area of illumination. They create a floodlight effect and can be used for short working distances.



LINE
Line lenses are standard.
Line, with a 10° width and a 50° fan angle, projects a thin, narrow beam of illumination.

Additional lens options available upon request.



MOUNTING

Smart Vision Lights recommends using a 5/16" drop-in T-nut with the T-slot for mounting.

ACCESSORIES

Jumper Cables (Daisy Chain)

Lengths	Part Number
300 mm	5PM12-J300
1000 mm	5PM12-J1000
2000 mm	5PM12-J2000

Power Cables

Lengths	Part Number
5 m	5PM12-5
10 m	5PM12-10
15 m	5PM12-15

Connector (Only for Direct Connect)

Description	Part Number
Set of 2 Connectors	LXJ-2DTN

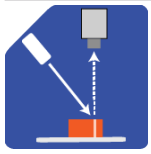
GLOSSARY

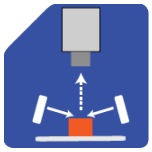
This glossary covers all Smart Vision Lights product families; some content in this section may not apply to this specific light.

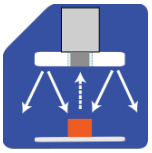
TERMINOLOGY

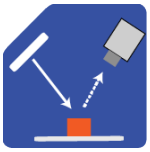
OverDrive™ Light includes an integrated high-current strobe driver for complete LED light control.
Continuous Operation Light stays on continuously.
Multi-Drive™ Combines continuous operation and OverDrive™ strobe (high-current strobe operation) modes into one easy-to-use light.
Built-In Driver The built-in driver allows full function without the need of an external driver.
Camera to Light Connecting the light directly to the camera, without the need for additional controllers or equipment.
Polarizers Filters that reduce reflections on specular surfaces.
Diffuser Used to widen the angle of light emission, reduce reflections, and increase uniformity.

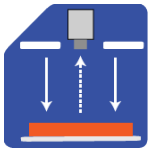
TYPES OF ILLUMINATIONS

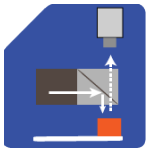

Projector

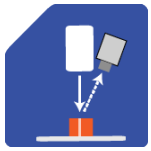

Dark Field

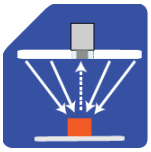

Radial

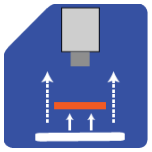

Bright Field


Direct


Axial

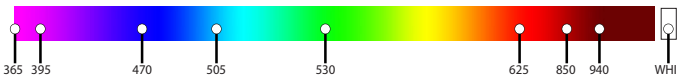

Line


Diffuse Panel


Backlight

COLOR/WAVELENGTHS LEGEND

Wavelength options range from 365 nm to 1550 nm.
Additional wavelengths available for many light families.



*See Part Number section for **this light's** available standard wavelengths.*

SWIR SHORTWAVE INFRARED

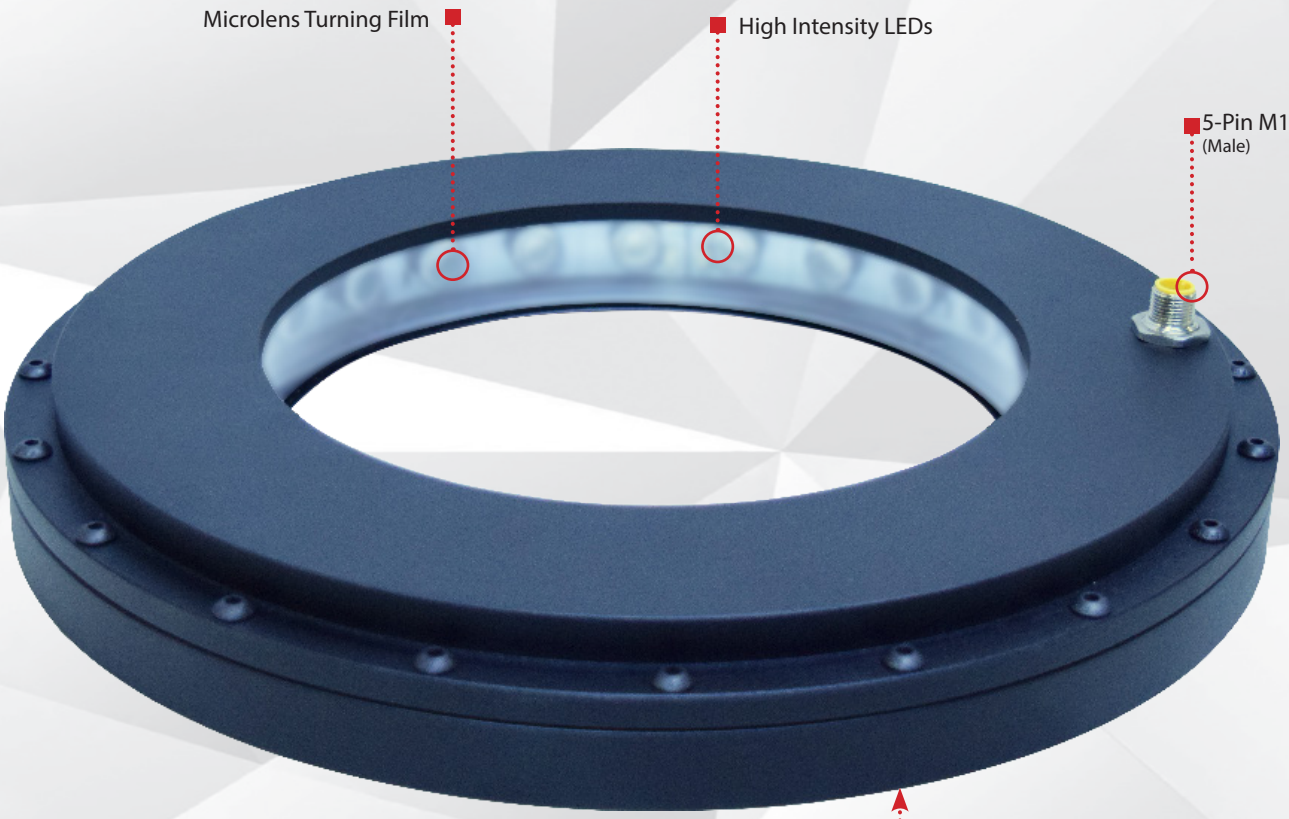
Shortwave infrared LEDs are available in 1050 nm, 1200 nm, 1300 nm, 1450 nm, and 1550 nm.
*Check Part Number section to see if **this light** is available in SWIR wavelengths.*

smart vision lights

DFLW-200 *Dark Field* RING LIGHT

MULTI-DRIVE™ | WASHDOWN

PRODUCT DATA SHEET



multi drive™

Warranty	Compliant	Compliant	Rated	Connector
10 YEAR	IEC 62471	CE RoHS	IP 68	5-PIN M12

PRODUCT HIGHLIGHTS

- ✓ Built-in Multi-Drive™ allows the light to work in continuous operation or OverDrive™ strobe mode
- ✓ Microlens turning film directs a beam of light at a 25° angle towards an object, resulting in a high concentration and uniform field of illumination
- ✓ SafeStrobe™ technology ensures protected operation of LEDs
- ✓ Built–in driver
- ✓ PNP and NPN trigger signal input

PRODUCT DESCRIPTION

The DFLW-200 Dark Field Washdown Ring Light is IP68 rated and comes in an anodized black aluminum housing. The built-in Multi-Drive™ driver allows the light to work in continuous operation or OverDrive™ strobe mode, depending on the wiring configuration. The industry-standard 5-pin M12 connector makes for simple wiring. The 1–10V DC analog signal line gives the user total control over intensity in continuous operation mode. Grounding the analog signal line put the light into OverDrive™ strobe mode.

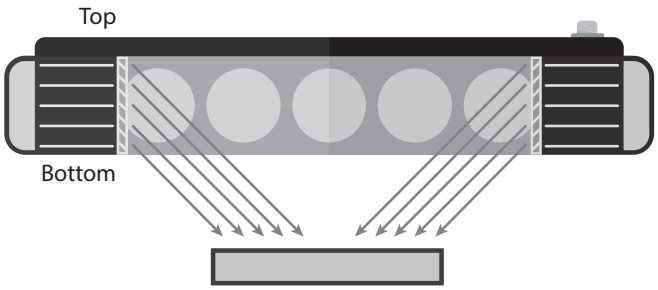
PRODUCT SPECIFICATIONS

	CONTINUOUS OPERATION	OVERDRIVE™ STROBE MODE
Electrical Input	24V DC +/- 5%	
Input Current	Max. 1.48 A	Max. 12.35 A
Wattage	Max. 35.5 W	Max. 296.4 W
PNP Line	4 mA @ 4V DC | 10 mA @ 12V DC | 20 mA @24V DC	
NPN Line	15 mA @ Ground (0 V DC)	
OverDrive™ Strobe Mode	**Not applicable**	Connect pin 5 to GND (see Wiring Configuration for more information)
Strobe Duration	**Not applicable**	Min. 10 µs | Max. 50 ms (see SafeStrobe™ Technology for more information)
Duty Cycle	**Not applicable**	Max. 10%
Strobe Input	**Not applicable**	PNP: +4V DC or greater to activate NPN: GND (<1V DC) to activate
Continuous Operation Mode	NPN can be tied to ground **OR** PNP can be tied to 24V DC (not both)	**Not applicable**
On/Off Input	PNP: +4V DC or greater to activate NPN: GND (<1V DC) to activate	**Not applicable**
Connection	5-pin M12 connector	
Ambient Temperature	0º–45ºC (32º–114ºF)	
IP Rating	IP68	
Weight	120 g	
Compliances	CE, RoHS, IEC 62471	

MICROLENS TURNING FILM

When combined with high-power LEDs, the microlens turning film directs a beam of light at a 25° angle toward the object, resulting in a high concentration and uniform field of illumination. This technique allows for a large-diameter dark field ring light to have an extended working distance while maintaining light intensity and uniformity.

The microlens requires the bottom of the light to be pointed towards the object being inspected. The bottom is the side without the connector.



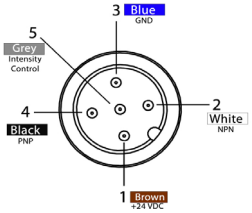
RESOURCE CORNER

Additional resources, including CAD files, videos, and application examples, are available on our website.

Smart Vision Lights
2359 Holton Road
Muskegon, MI 49445
P: +1 231.722.1199 | F: +1 231.722.9922
smartvisionlights.com
techsupport@smartvisionlights.com
Hours: Monday — Friday | 8 am–5 pm ET

WIRING CONFIGURATION

CONTINUOUS OPERATION MODE



Pin layout for light (male connector)

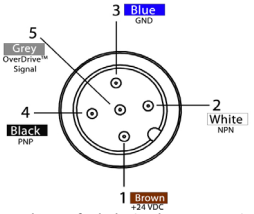
Pins	Function	Signal	Wire Color
1	Power In	+24 V DC	BROWN
2	NPN	Sinking Signal	WHITE
3	GND	Ground	BLUE
4	PNP	Sourcing Signal	BLACK
5	Intensity Control	1-10 V DC**	GREY*

** Some cables use green/yellow for pin 5*
*** For maximum intensity, it is possible to tie pin 5 to pin 1 at +24 V DC.*
For continuous mode: PNP (pin 4) can be tied to +24 V DC (pin 1) ***or*** *NPN (pin 2) can be tied to Ground (pin 3).*

For the light to function properly, apply either a PNP or NPN signal, not both.

Failure to supply light with correct input current will result in nonrepeatable lighting.
(See Product Specifications for requirement.)

OVERDRIVE™ STROBE MODE



Pin layout for light (male connector)

Pins	Function	Signal	Wire Color
1	Power In	+24 V DC	BROWN
2	NPN	Sinking Signal	WHITE
3	GND	Ground	BLUE
4	PNP	Sourcing Signal	BLACK
5	OverDrive™ Signal	Ground	GREY*

** Some cables use green/yellow for pin 5*

Failure to supply light with correct input current will result in nonrepeatable lighting.
(See Product Specifications for requirement.)

LIGHT PATTERNS

Smart Vision Lights recommends the DFLW-200 be used at a working distance between 20 mm and 75 mm.

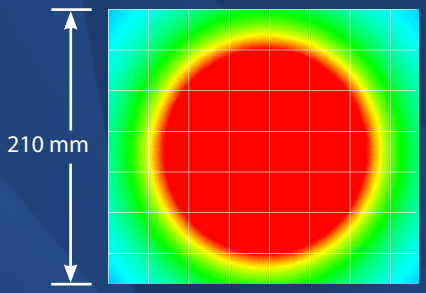
LIGHTING ILLUMINATION FOR THE DFLW-200

Continuous Operation Mode	
Typical Output Performance	Illuminance (Lux)
Distance = 25 mm	60,000
Illuminance measurement taken on White Light, 4800 K	

OverDrive™ Mode	
Typical Output Performance	Illuminance (Lux)
Distance = 25 mm	330,000
Illuminance measurement taken on White Light, 4800 K	

The DFLW-200 Ring Light produces a uniform light pattern.

WD = Working Distance Grid set to 30 mm x 30 mm



WD = 25 mm

MULTI-DRIVE™

Multi-Drive™ offers the best of both worlds. Continuous operation and OverDrive™ mode (HIGH output strobe/pulse) are available in a single light. Other advantages of Multi-Drive™ include faster imaging and capture/freeze motion on high-speed lines.

The Multi-Drive™ feature allows the user to run the light continuously or in OverDrive™ at the maximum allowed intensity by simply setting the product configuration. OverDrive™ strobe mode has **up to eight times** the power of continuous operation.

SAFESTROBE™ TECHNOLOGY

SafeStrobe™ technology is a unique technology that applies safe working parameters to ensure high-current LED's are not damaged by driving them beyond their limits, such as maximum strobe time or duty cycle. This is especially beneficial for overdriving our high-current LED's.

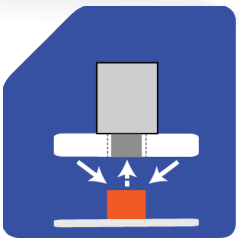
MOUNTING

Mounting options include four M6 threaded holes located on the DFLW-200.

Hardware included with light:
(2) M6 screws (hex)

ILLUMINATION

The DFLW-200 Dark Field Ring Lights works best for:



Dark Field

EYE SAFETY

According to IEC 62471:2006. Full documentation available upon request.

Notice

Exempt Group: No photobiological hazard to eyes or skin even for continuous, unrestricted use. Applicable for wavelength 625.

Caution

Risk Group 1: Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to eyes. Safe for most applications except prolonged exposure. Applicable for wavelengths 470, 530, and WHI.

PART NUMBER

DFLW-200 – □□□ – □□

COLOR:

WHI | 470 | 530 | 625 | 850

HOUSING

Leave blank for Anodized Black Aluminum

SS = Stainless Steel

Part Number Examples:

DFLW-200-625 (DFLW-200, 625 nm Red Wavelength)

DFLW-200-625-SS (DFLW-200, 625 nm Red Wavelength, Stainless Steel housing)

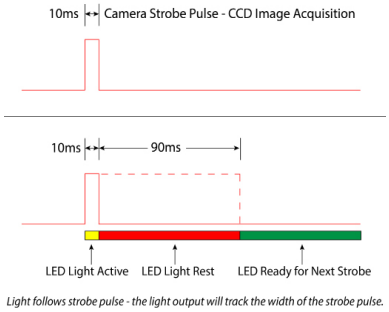
Additional wavelength and lens options available upon request

DUTY CYCLE (OVERDRIVE™ MODE ONLY)

This section applies only if light is in OverDrive™ strobe mode.

Maximum Duty Cycle for OverDrive™ light is 10% (0.1)

The Duty Cycle (D) is related to the Strobe Time (ST) and Rest Time (RT).



Light follows strobe pulse - the light output will track the width of the strobe pulse.

Calculating Rest Time

$$RT = \frac{ST}{D} - ST$$

RT = Rest Time
ST = Strobe Time
D = Duty Cycle

Example

$$90\ ms = \frac{10\ ms}{.1} - 10\ ms$$

Rest Time is 90 ms for 10 ms Strobe Time

Calculating Strobe Rate

$$SR = \frac{D}{ST}$$

SR = Strobe Rate (strobes per second)
ST = Strobe Time (seconds)
D = Duty Cycle

Example

$$1000 = \frac{0.1}{0.0001}$$

Strobe Rate is 1000 strobes per second

Calculating Duty Cycle

$$D = ST \times SR$$

SR = Strobe Rate (strobes per second)
ST = Strobe Time (seconds)
D = Duty Cycle

Example

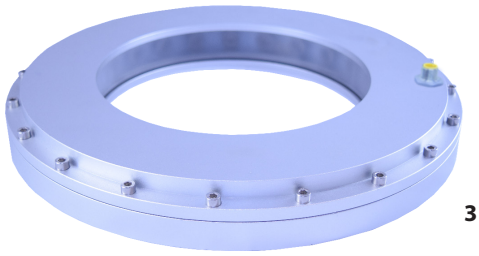
$$0.1 = 0.0001 \times 1000$$

Duty Cycle is 10% (0.1)

Note: Strobe time is limited by the strobe rate.

STAINLESS-STEEL VERSION

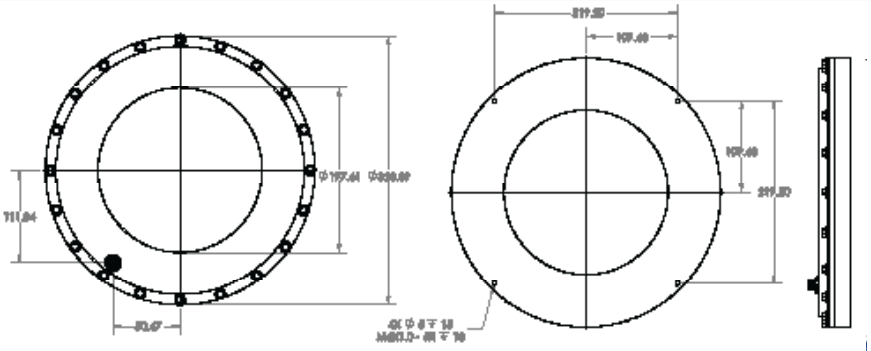
The DFLW-200 is available in a stainless-steel housing. Stainless-steel housing is recommended for any food grade application.
Lead time for the stainless-steel version of the DFLW-200 is longer than that of the anodized black aluminum housing version.



316 Stainless-Steel Housing

Add - SS to end of part number for Stainless-Steel

PRODUCT DRAWING



CAD files available on our website.
Dimensions are in mm.

ACCESSORIES

Power Cables

Lengths	Part Number
5 m	5PM12-5
10 m	5PM12-10
15 m	5PM12-15

Power Cables (Washdown)

Lengths	Part Number
15 m	W5PM12-15

Washdown cables have a 316 stainless-steel connector(s).

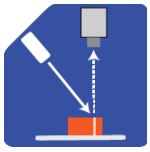
GLOSSARY

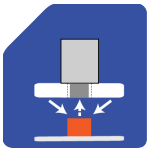
This glossary covers all Smart Vision Lights product families; some content in this section may not apply to this specific light.

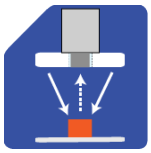
TERMINOLOGY

OverDrive™ Light includes an integrated high-current strobe driver for complete LED light control.
Continuous Operation Light stays on continuously.
Multi-Drive™ Combines continuous operation and OverDrive™ strobe (high-current strobe operation) modes into one easy-to-use light.
Built-In Driver The built-in driver allows full function without the need of an external driver.
Camera to Light Connecting the light directly to the camera, without the need for additional controllers or equipment.
Polarizers Filters that reduce reflections on specular surfaces.
Diffuser Used to widen the angle of light emission, reduce reflections, and increase uniformity.

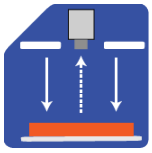
TYPES OF ILLUMINATIONS

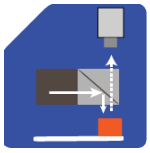

Projector

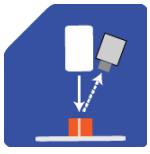

Dark Field

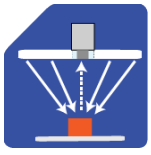

Radial

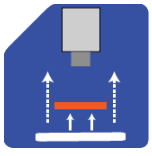

Bright Field


Direct


Axial

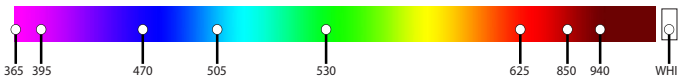

Line


Diffuse Panel


Backlight

COMMON COLOR/WAVELENGTHS LEGEND

Wavelength options range from 365 nm to 1550 nm.
Additional wavelengths available for many light families.



See Part Number section for **this light's available standard wavelengths.*

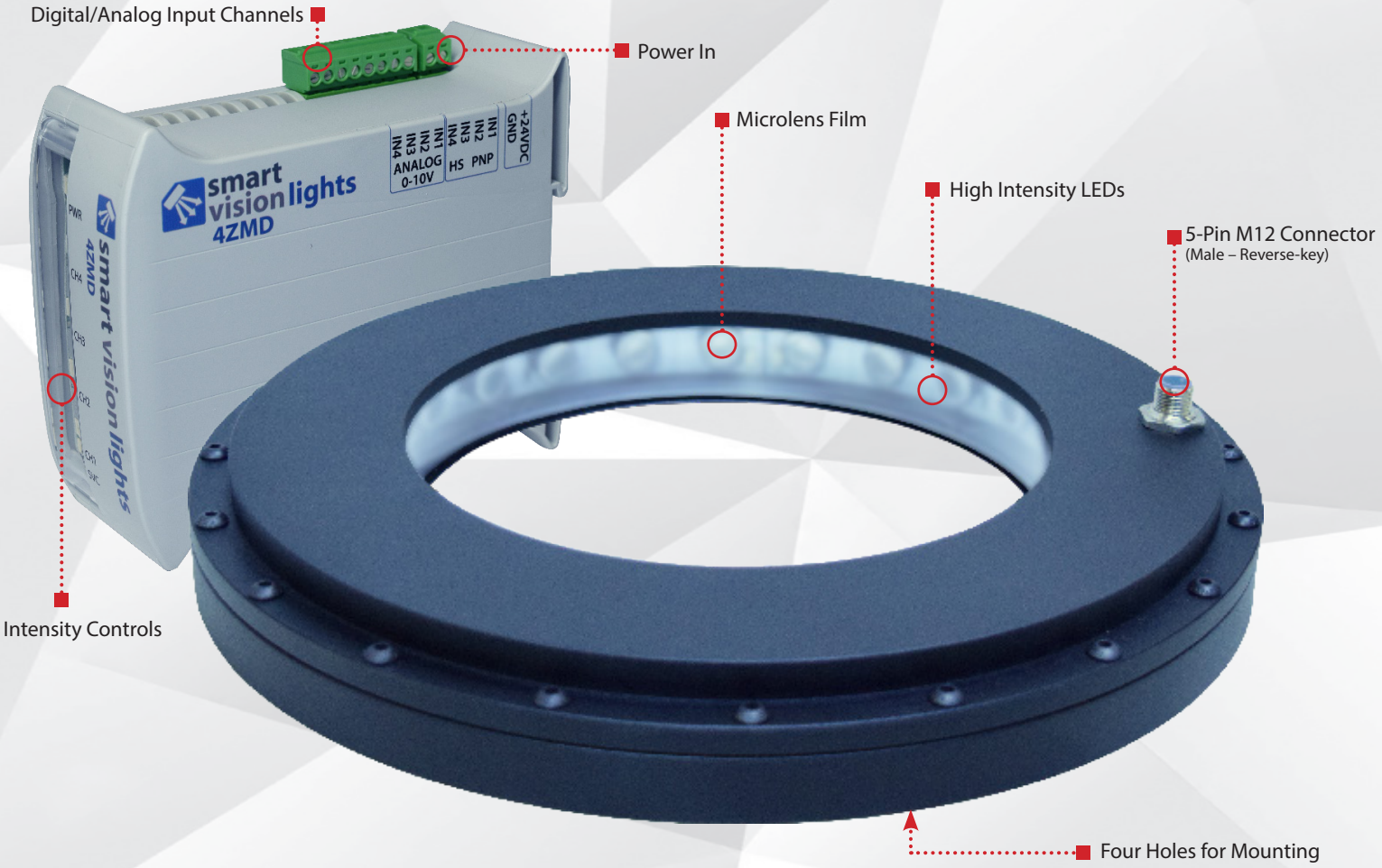
SWIR SHORT WAVE INFRARED

Short Wave Infrared LEDs are available in 1050 nm, 1200 nm, 1300 nm, 1450 nm, and 1550 nm.

smart vision lights DFLW-200-4Z *Dark Field* RING LIGHT KIT

ZONE LIGHT | WASHDOWN

PRODUCT DATA SHEET



multi drive™

Warranty	Compliant	Compliant	Rated	Connector
10 YEAR	IEC 62471	CE RoHS	IP 68	5-PIN M12

PRODUCT HIGHLIGHTS

- ✓ Four individual zones built into a single light
- ✓ Kit includes the 4ZMD-750, which allows for continuous operation or OverDrive™ strobe mode for each channel
- ✓ Built-in individual intensity control channels for either continuous operation or OverDrive™ strobe mode
- ✓ Microlens film directs a beam of light at a 25° angle towards an object, resulting in a high concentration and uniform field of illumination

PRODUCT DESCRIPTION

DFLW-200-4Z

The DFLW-200-4Z Dark Field Washdown Ring Light is IP68 rated and comes in an anodized black aluminum housing. The DFLW-200-4Z has four zones, making it a quadrant light in which each individual zone can be controlled independently of each other.

4ZMD-750

The 4ZMD is an external driver that permits control of up to four separate light zones either independently or simultaneously, in any combination. The 4ZMD has independent intensity controls and built-in Multi-Drive™, allowing a range to be set from 10%–100% for continuous operation or OverDrive™ strobe mode. **The maximum continuous current for the 4ZMD-750 is 750 mA when connected to the DFLW-200-4Z.**

When connected to a LED Light Manager (LLM), each individual channel can be set to continuous on, off, or any intensity level in between, and even OverDrive™ strobe mode. **For more information about the LLM, visit smartvisionlights.com/products/llm.**

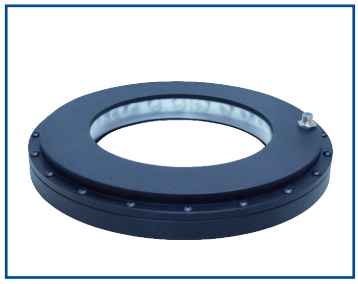
WHAT'S INCLUDED

When you order a DFLW-200-4Z ring light, such as the DFLW-200-4Z-WHI, the following item is included:

DFLW-200-4Z requires an external constant current driver with maximum 750 mA per channel.

DFLW-200-4Z
RING LIGHT

When you order a DFLW-200-4Z ring light kit, such as the DFLW-200-4Z-WHI-KIT, the following items are included:



DFLW-200-4Z
RING LIGHT

+

4ZMD-750
DRIVER

+

5PM12-J2000-KR
CABLE

RESOURCE CORNER

Additional resources, including CAD files, videos, and application examples, are available on our website.

PRODUCT SPECIFICATIONS

DFLW-200-4Z

PER CHANNEL	CONTINUOUS OPERATION	OVERDRIVE™ STROBE MODE
Maximum LED Input Current	1.8A	12.0 A
Input Connector	5-pin M12 connector (male — reverse-key)	
Strobe	**Not applicable**	Max. 50 ms
Duty Cycle	**Not applicable**	Max. 10%
Ambient Temperature	0º–45ºC (32º–114ºF)	
IP Rating	IP68	
Weight	~120 g	
Warranty	10 year. For complete warranty information, visit smartvisionlights.com/warranty	
Compliances	CE, RoHS, IEC 62471	

NOTE:
The DFLW-200-4Z requires an external constant current driver, such as the recommended 4ZMD-750.

4ZMD-750

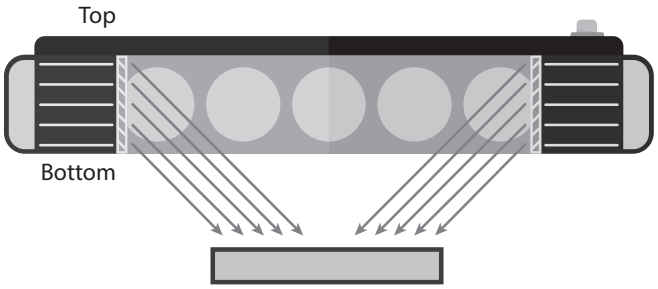
OUTPUT PER CHANNEL	CONTINUOUS OPERATION	OVERDRIVE™ STROBE MODE
Electrical Input	24VDC +/- 5%	
Operating Current (No Load)	70 mA	
Electrical Input Connector	2-position screw terminal block — 14 AWG max wire size	
Number of Input Channels	4	
Input Connector	8-position screw terminal block — 14 AWG max wire (4 for PNP and 4 for analog)	
Input Channel Current	PNP input: 4 mA @ 4VDC | 10 mA @12VDC | 20 mA@ 24VDC	
Strobe Duration	N/A	Min. 10 µs | Max. 50 ms (see SafeStrobe™ Technology for more information)
Duty Cycle	N/A	Max. 10% (see Duty Cycle for more information)
Analog Intensity	The output is adjustable from 10%–100% of intensity by applying 1–10VDC signal	OverDrive™ Strobe Mode: Apply 0VDC
Output Channels	4 channels for light zones	
Output Connector	5-pin M12 connector (female – reverse-key)	
Indicator Lights	Power on = Green light Individual channel = Yellow light Service = Red light	
Mounting	DIN rail	
Ambient Temperature	-18°-40° C (0°-104° F)	
Ambient Humidity	0-95% non-condensing	
Weight	~230g	
Warranty	3 years. For complete warranty information, visit smartvisionlights.com/warranty	
Compliances	CE, RoHS	

TOTAL INPUT PER UNIT (MAX)	CONTINUOUS OPERATION	OVERDRIVE™ STROBE MODE
Input Current	2.1 A	19 A
Input Power	50.4 W	460 W

MICROLENS FILM

When combined with high-power LEDs, the microlens turning film directs a beam of light at a 25° angle toward the object, resulting in a high concentration and uniform field of illumination. This technique allows for a large-diameter dark field ring light to have an extended working distance while maintaining light intensity and uniformity.

The microlens requires the bottom of the light to be pointed towards the object being inspected. The bottom is the side without the connector.



LED COLOR ACCURACY

To ensure accurate color matching between lights, Smart Vision Lights features a color consistent, 3-step MacAdam ellipse LED package with a nominal 5700 K color temperature.

LIGHT PATTERNS

LIGHTING ILLUMINATION FOR THE DFLW-200-4Z

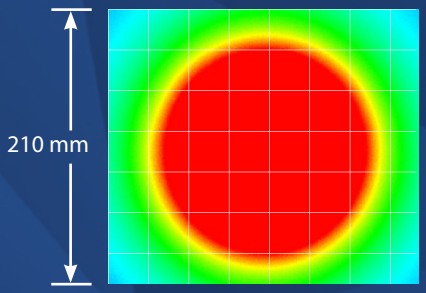
Continuous Operation Mode		
Typical Output Performance	Illuminance (Lux)	
	1 Zone	All Zones
Distance = 100 mm	25,500	102,000

OverDrive™ Mode		
Typical Output Performance	Illuminance (Lux)	
	1 Zone	All Zones
Distance = 100 mm	123,000	495,000

Smart Vision Lights recommends using the DFLW-200-4Z at a working distance between 50 mm and 200 mm.

The DFLW-200 Ring Light produces a uniform light pattern.

WD = Working Distance Grid set to 30 mm x 30 mm



MULTI-DRIVE™

Multi-Drive™ offers the best of both worlds. Continuous operation and OverDrive™ mode (HIGH output strobe/pulse) are available in a single light. Other advantages of Multi-Drive™ include faster imaging and capture/freeze motion on high-speed lines.

The Multi-Drive™ feature allows the user to run the light continuously or in OverDrive™ at the maximum allowed intensity by simply setting the product configuration. OverDrive™ strobe mode has **up to five times** the power of continuous operation.

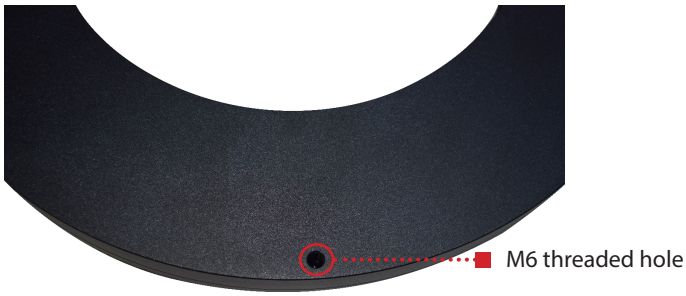
SAFESTROBE™ TECHNOLOGY

SafeStrobe™ technology is a unique technology that applies safe working parameters to ensure high-current LED's are not damaged by driving them beyond their limits, such as maximum strobe time or duty cycle. This is especially beneficial for overdriving our high-current LED's.

MOUNTING

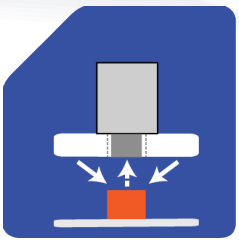
Mounting options include four M6 threaded holes located on the DFLW-200-4Z.

Hardware included with light:
(2) M6 screws (hex)



ILLUMINATION

The DFLW-200-4Z Dark Field Ring Lights works best for:



Dark Field

EYE SAFETY

According to IEC 62471:2006. Full documentation available upon request.

Notice

Exempt Group: No photobiological hazard to eyes or skin even for continuous, unrestricted use. Applicable for wavelength 625.

Caution

Risk Group 1: Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to eyes. Safe for most applications except prolonged exposure. Applicable for wavelengths 470, 530, and WHI.

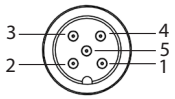
OUTPUT CONFIGURATION

Using the Reverse-Key 5-pin M12 Connector

When connecting a Smart Vision Lights four-zone lights to the 4ZMD, a reverse-key 5-pin M12 cable is required. All Smart Vision Lights four zone lights come equipped with a 5-pin reverse-key connector.

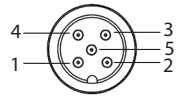
The reverse-key 5-pin M12 connector simplifies connecting lights to the 4ZMD, with very little wiring needed.

4ZMD



Reverse-Key 5-pin M12 Connector (female)

DFLW-200-4Z



Reverse-Key 5-pin M12 Connector (male)

NOTE:

Smart Vision Lights uses reverse-key cables that have a blue-grey tip on the connectors.

5-Pin M12 Connectors (Female) Pin Layout

Pin	Channel	Color
1	Common	Brown
2	1	White
3	2	Blue
4	3	Black
5	4	Green/Yellow

INPUT CONFIGURATION

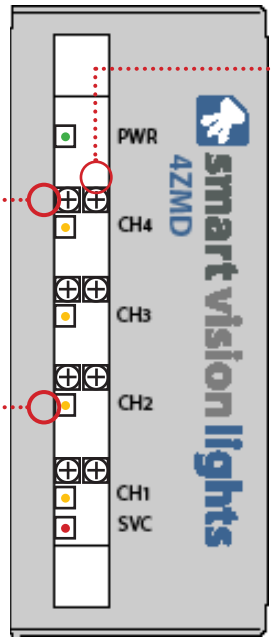
Using Input Terminal Block

Input terminal block is also used when connecting to the LED Light Manager (LLM). Smart Vision Lights recommends using the cable provided (part number: IC-400) to connect the 4ZMD driver to the LLM.

LLM Output Channels	4ZMD Input Channels
DO1	PNP IN1
DO2	PNP IN2
DO3	PNP IN3
DO4	PNP IN4
DO5/AO1	Analog 1
DO6/AO2	Analog 2
DO7/AO3	Analog 3
DO8/AO4	Analog 4

ADJUSTING INTENSITY

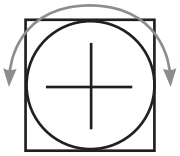
The 4ZMD allows for the control of up to four individual channel intensity levels. Depending on how each channel is wired, its intensity can be adjusted for either continuous operation or OverDrive™ strobe mode. Each channel intensity can be adjusted either in continuous operation or OverDrive™ strobe mode, but not both modes simultaneously. Each channel has a yellow indicator light that will illuminate when the channel is active.



Intensity Control Pot for Continuous Operation

Intensity Control Pot for OverDrive™

Channel Indicator LED (yellow)



270° turn pot
Clockwise = Increase intensity
Counterclockwise = Decrease intensity

NOTE:

When in continuous operation, channel intensity can be individually adjusted using 1–10VDC on the analog input.

NOTE:

When managing the 4ZMD with the LED Light Manager (LLM), turn the intensity pots on the front of the 4ZMD fully clockwise to ensure intensity is completely controlled by the LLM.

UNDERSTANDING ZONES

The DFLW-200-4Z has four individual built-in zones that can act independently. Each zone can be set to continuous on, off, any intensity level in between, and even OverDrive™ strobe mode. Intensity levels can be set by programming a LLM to control the zones or using the intensity controls on the front of the 4ZMD (see Managing Zones and Adjusting Intensity).

The DFLW-200-4Z allows any combination of the four zones to be turned on at the same time, including adjacent and opposing zones.

One Zone | Two Zones | Three Zones | Four Zones | Opposing Zones

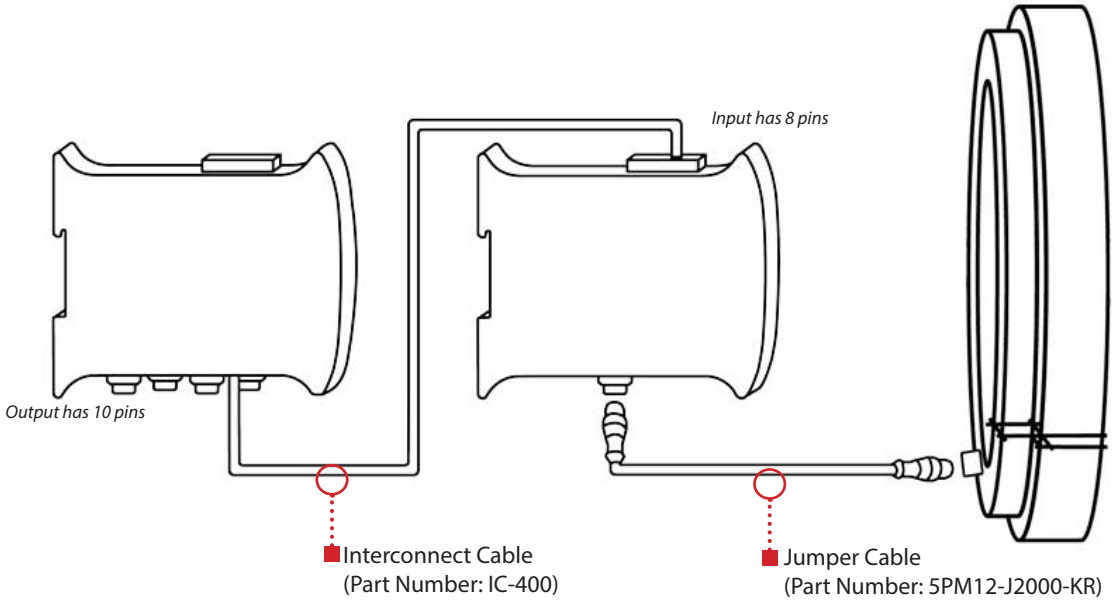
MANAGING ZONES

Connect the LLM to the 4ZMD driver. The LLM allows for easy control of each individual zone. The event programmed within the LLM can contain multiple sequences. Users can set each zone independently to continuous on, off, or any intensity level in between, and even OverDrive™ strobe mode.

For more information about the LLM, visit: smartvisionlights.com/products/llm.

WIRING CONFIGURATION

Input Channels for 4ZMD
Power In — Power source
HS PNP — High-speed PNP strobing/trigger
Analog 0–10 V — Input for setting intensity for continuous mode (1–10VDC) or OverDrive™ strobe mode (0VDC)



PART NUMBER

DFLW-200-4Z – □□□ – □□ – □□□

COLOR:

WHI 470 530 625 850

HOUSING

Leave blank for Anodized Black Aluminum

SS = Stainless Steel

KIT

Leave blank for only light.

KIT = Kit Includes light, cable and external driver

Part Number Examples:

DFLW-200-4Z-625	DFLW-200-4Z, 625 nm red wavelength, standard housing light only
DFLW-200-4Z-WHI-KIT	DFLW-200-4Z, WHI, KIT white, standard housing, light, cable and external driver
DFLW-200-4Z-WHI-SS-KIT	DFLW-200-4Z, WHI, KIT white, stainless steel housing, light, cable and external driver

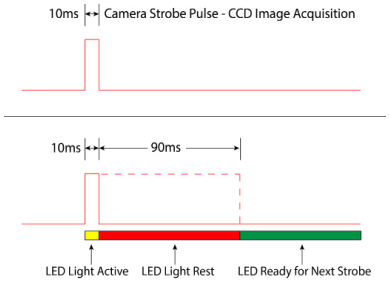
Additional wavelength available upon request

DUTY CYCLE (OVERDRIVE™ MODE ONLY)

This section applies only if light is in OverDrive™ strobe mode.

Maximum Duty Cycle for OverDrive™ light is 10% (0.1)

The Duty Cycle (D) is related to the Strobe Time (ST) and Rest Time (RT).



Light follows strobe pulse - the light output will track the width of the strobe pulse.

Calculating Rest Time

$$RT = \frac{ST}{D} - ST$$

RT = Rest Time
ST = Strobe Time
D = Duty Cycle

Example

$$90\text{ ms} = \frac{10\text{ ms}}{.1} - 10\text{ ms}$$

Rest Time is 90 ms for 10 ms Strobe Time

Calculating Strobe Rate

$$SR = \frac{D}{ST}$$

SR = Strobe Rate (strobes per second)
ST = Strobe Time (seconds)
D = Duty Cycle

Example

$$1000 = \frac{0.1}{0.0001}$$

Strobe Rate is 1000 strobes per second

Calculating Duty Cycle

$$D = ST \times SR$$

SR = Strobe Rate (strobes per second)
ST = Strobe Time (seconds)
D = Duty Cycle

Example

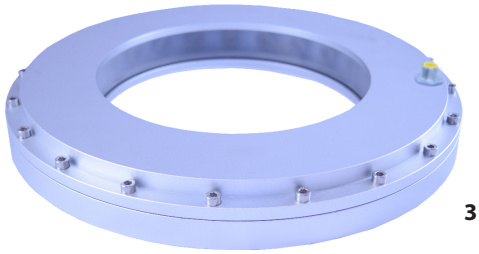
$$0.1 = 0.0001 \times 1000$$

Duty Cycle is 10% (0.1)

Note: Strobe time is limited by the strobe rate.

STAINLESS-STEEL VERSION

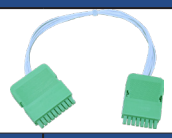
The DFLW-200-4Z is available in a stainless-steel housing. Stainless-steel housing is recommended for any food grade application.
Lead time for the stainless-steel version of the DFLW-200 is longer than that of the anodized black aluminum housing version.



316 Stainless-Steel Housing

Add - SS to end of part number for Stainless-Steel

ACCESSORIES

Interconnect Cable	
	
Lengths	Part Number
400 mm	IC-400

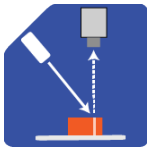
GLOSSARY

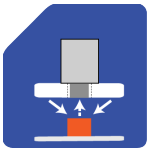
This glossary covers all Smart Vision Lights product families; some content in this section may not apply to this specific light.

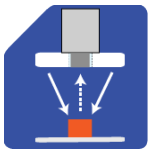
TERMINOLOGY

OverDrive™ Light includes an integrated high-current strobe driver for complete LED light control.
Continuous Operation Light stays on continuously.
Multi-Drive™ Combines continuous operation and OverDrive™ strobe (high-current strobe operation) modes into one easy-to-use light.
Built-In Driver The built-in driver allows full function without the need of an external driver.
Camera to Light Connecting the light directly to the camera, without the need for additional controllers or equipment.
Polarizers Filters that reduce reflections on specular surfaces.
Diffuser Used to widen the angle of light emission, reduce reflections, and increase uniformity.

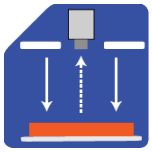
TYPES OF ILLUMINATIONS

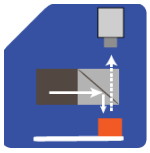

Projector

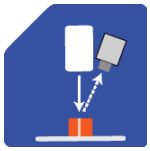

Dark Field

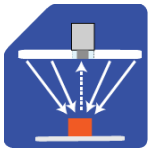

Radial

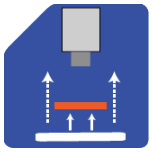

Bright Field


Direct


Axial

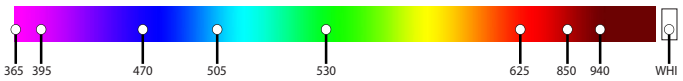

Line


Diffuse Panel


Backlight

COMMON COLOR/WAVELENGTHS LEGEND

Wavelength options range from 365 nm to 1550 nm.
Additional wavelengths available for many light families.



See Part Number section for **this light's available standard wavelengths.*

SWIR SHORT WAVE INFRARED

Short Wave Infrared LEDs are available in 1050 nm, 1200 nm, 1300 nm, 1450 nm, and 1550 nm.